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DEPARTMENT OF STATISTICS

November 15, 1971

Mr. H. Thomas Austern
Covington & Burling
888 Sixteenth Street N.W.
Washington, D.C. 20006

Dear Mr. Austern:

As requested, I have examined the data records consisting of laboratory test calculations and statistical summary sheets which you represented to me to be copies of original data sheets compiled by the Federal Trade Commission and used as the basis of figures on "tar" (Dry TPM) and nicotine yields of various brands of cigarettes as well as the final reports on these data released by the Federal Trade Commission.

It was the data sheets for the "tar" and nicotine figures by cigarette brands released by the Federal Trade Commission under the date August 1971 which I examined and upon which I report in this letter.

The nicotine and "tar" figures compiled by the FTC laboratory are now required to be included in cigarette advertising and in New York City are the basis upon which the cigarette tax is determined. It is obvious that such figures should be meticulously compiled with great regard to the accuracy and integrity of the published values.

My examination of the basic laboratory sheets for this test (Number 9) shows a continuation of the improved level of calculational errors as compared with the early tests[1] for tests of brand cigarettes but a continuing higher level of errors for monitor cigarette calculations. The details of the errors found are cited later.

As in prior tests, my examination of the basic data sheets showed evidence of variations of an unknown nature resulting in wide swings in the daily average nicotine and "tars" as well as shifts over extended periods of time in the levels of the reported data. These phenomena are similar to those reported in my prior letters as found in previous test data.

A. Variation in Test Levels

In accordance with sound scientific methods, the Federal Trade Commission laboratory included control (monitor) cigarettes in their smoking runs for the determination of nicotine and "tar" (Dry TPM) delivery levels of the brands

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1. The prior 8 tests performed by the Federal Trade Commission laboratory were dated November 20, 1967(Test 1), June 11, 1968(Test 2), October 10, 1968(Test 3), February 27, 1969(Test 4), July 9, 1969(Test 5), November 19, 1969(Test 6), May 18, 1970(Test 7), October 21, 1970(Test 8).

of cigarettes tested. These monitor cigarettes are samples from a homogeneous larger group of cigarettes prepared especially for this purpose. All smoking machine runs are said to have included several ports which are dedicated to the smoking of these monitor cigarettes, the results of which are processed in the same manner as the brands being tested.

The purpose of such control (or monitor) cigarettes is to detect shifts or unusual variations arising out of changes in laboratory conditions, such as variations in the smoking machines, laboratory humidity, the work of technicians performing the tests, in the chemical processes used in the determinations or in other laboratory conditions.

Customarily, when "controls" are used and indicate shifts or unusual variations in the levels of experimental results, all of the data in that run are rejected or alternatively adjusted by the amount of the variation reflected in the results from these tests.

The results of the tests of monitor cigarettes were summarized by the Federal Trade Commission in a set of daily summary sheets(2).

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2. The daily average results from Dry TPM for the monitor cigarettes are listed in Appendix I.

There is clear evidence that for some undetermined reason the level of "tar" (Dry TPM) suddenly shifted upward during the period May 19 to June 9, 1971 as contrasted with the rest of the period. The average "tar" (Dry TPM) values for the monitor cigarettes rose to 19.96 mgms as contrasted with 19.59 for the rest of the period. In similar fashion, the majority of the averages of Dry TPM for brand cigarettes also rose in that period. This is summarized in the table below:

TPM-H₂O ?

Federal Trade Commission
Test Data Dated August 1971
TPM (Dry) Determinations

Period	Monitor Cigarettes Average TPM	Brand Cigarettes* No. of Brands With Higher Average
May 19-June 9	19.96	87
Balance of Period**	19.59	34
		121

19.3

*Calculations were carried to additional decimals in a few cases to reduce the number of ties. However, there were 4 brands which had identical averages for both periods. These are not included in the above table. The daily averages for the above brands for each period are shown in Appendix II.

**May 10 to June 8 and June 10 to July 16, 1971.

If there were no shifts in the levels for brand cigarettes between the two periods, it would be expected that half of the TPM (Dry) averages would be higher for each of the two periods. This is obviously not so! The probability that the averages for as many as 87 out of 121 brands would be higher for the period May 19 to June 9 as contrasted with the remainder of the period if the two levels remained the same as .0000008. Therefore, it may be said that the difference in the brand levels is statistically significant and not due to chance variation.

As previously, there is evidence of shifts in the results for individual days as evidenced by the values obtained for the monitor cigarettes for those days together with similar shifts for the individual brands as compared with the data for other days.

The table below illustrates these daily shifts encountered in this test. The data for the TPM (Dry) for both monitor and brand cigarettes were unusually high on June 8, 1971 as compared with the rest of the period.

Federal Trade Commission
Cigarette Test
Data Dated August 1971
TPM (Dry) Determinations
Test Data for June 8 Compared to Other Days

Period	Monitor Cigarette Average TPM (Dry)	Number of Brands* With Higher Average
June 8, 1971	20.3	33
Balance of Days	19.7**	20

*For those brands for which tests were conducted in part on June 8.

**Excluding value for June 8

NOTE: The TPM (Dry) figures for June 8 and for other days for the brands involved are shown in Appendix III.

The number of brands with higher average TPM (Dry) on June 8, 1971 as compared with other days was higher, with a statistically significant difference.[3]

Once again, in spite of all the continued evidence of variation, reflected in the monitor cigarette data, no adjustments were made to the associated brand cigarette figures for the periods involved.

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[3] Based on a signs test the difference was significant at the .05 level which means that there is less than a .05 probability that the difference was an accidental or chance difference.

B. Calculational Errors

No matter how carefully the laboratory determinations are conducted and how adequate the equipment and technicians involved, the results are of little value unless the subsequent numerical calculations and other manipulations are correctly performed.

The improvement in calculational accuracy noted in my report on Test No. 8 with reference to brand data, continues for these new data (Test No. 9). There were only 4 calculational errors for brand data in the worksheets for the data dated August 1971. These errors are listed in Appendix IV.

However, the number of errors in the monitor cigarette worksheets continue at about the same level as observed in prior reports. There were 18 calculational errors in the monitor cigarette worksheets. The errors ranged from relatively small mistakes up to a disparity of 1.6 mgm. These errors are listed in Appendix V.

It is to be noted that minor errors of less than 0.2 mgm for TPM and 0.02 mgm for nicotine were not included in the count above.

Further, a new type of error has suddenly appeared. This error which was found on 2 laboratory worksheets was particularly disturbing. In these 2 cases, the filter holder weight after smoking was less than before. This, of course, is not possible!

In the calculations involved, these values were treated as though the first figure before the decimal was one lower. Thus, for instance, for the Winston, f, 100,sp test on July 20, 1971 (run 4 - port 17), the weight after is recorded as 32.2085 and the weight before as 33.0930. The figures were treated as 33.2085 and 33.0930 respectively. Actually, these two figures may have been inverted in their entry in which case a different TPM results.

The disturbing feature of this kind of error is that it indicates the possibility of carelessness in recording the experimental results. This kind of error cannot be checked upon by me. It is not known how many less obvious mistakes arose from incorrect entry of the figures on the laboratory worksheets.

Sincerely,

Herbert Arkin

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